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(54) Title
PHARMACEUTICAL COMPOSITION OF BUPRENORPHINE TOGETHER WITH NALTREXONE

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(56) Prior Art Documents
36329/84 A61K 31/485
US 4457933
US 4464378

(57) SUBLINGUAL UNIT DOSAGE ALSO CLAIMED.

We have now found that there is a limited range of ratios of buprenorphine with naltrexone for which, by injection, the analgesic performance is equal to that of buprenorphine alone whilst the abstinence-precipitating effects in opiate-dependent subjects are equivalent to that of naltrexone alone. This is a surprising finding since, when the opiates such as morphine, methadone, and oxycodone are mixed with an opiate antagonist the agonist-antagonist interaction reduces the analgesic performance of the agonist and in complementary fashion reduces the opiate-inhibitory performance of the antagonist.

We have found that the bioavailability of naltrexone by the sublingual route is ~18%; however the sublingual bioavailability of buprenorphine (~50%) is superior to that of naltrexone and since we have shown that in a limited range of dosage ratios by parenteral administration naltrexone, with full bioavailability, could be combined with buprenorphine without affecting its analgesic performance, we were able to extend our findings to an equivalent limited range of dosage ratios for sublingual and buccal administration which would achieve similar results and afford protection against parenteral misuse.

According to this invention there is provided an analgesic composition in parenteral unit dosage form comprising an active dose of buprenorphine and an amount of naltrexone sufficient to prove aversive to a narcotic addict by parenteral administration but insufficient to compromise the analgesic action of the buprenorphine wherein the dose of buprenorphine is from 0.3mg to 0.6mg and the weights of naltrexone to buprenorphine are within the ratio of 1:12 to 1:3.

In another aspect of the present invention, there is provided an analgesic composition in sublingual unit dosage form comprising an active dose of buprenorphine and an amount of naltrexone sufficient to prove aversive to a narcotic addict by parenteral administration but insufficient to compromise the analgesic action of the buprenorphine wherein the dose of buprenorphine is from 0.1mg to 0.4mg and the weights of naltrexone to buprenorphine are within the ration of 1:4 to 1:1.

It is to be understood that the use of the terms buprenorphine and naltrexone comprehend not only the bases but also their pharmaceutically acceptable salts. Particular preferred salts are the hydrochlorides.

It will be appreciated that the required ratio of naltrexone to buprenorphine is dependent upon the proposed route of administration. Preferably the parenteral unit dosage form contains naltrexone and buprenorphine in a weight ratio of about 1:6 and the sublingual form in a ratio of about 1:2.

The ratios were determined in our laboratories according to the following methods.

In the rat tail pressure test (Green, Young, Br. J. Pharmac. Chemother., 6, 572 (1957)) the maximum antinociceptive effect (ED_{90}) with buprenorphine was achieved at a dose of 0.03mg/kg, by subcutaneously administration (s.c.). This dose was selected for the evaluation of the influence of co-administration of naltrexone on the antinociceptive effect of buprenorphine. Inclusion of naltrexone at the dose of 0.005mg/kg with the buprenorphine dose produced no significant antagonism (Figure 1). Increasing the naltrexone content to 0.01 and 0.02mg/kg produced significant antagonism of the antinociceptive effect of buprenorphine at 30 minutes and at these ratios the trend was maintained over 60 minutes.

The ability to precipitate abstinence in morphine-dependent rats has been evaluated using the method of Teiger D.G., J. Pharmac. exp. Ther. 190, 408 (1974).

Table 1 presents the mean behavioural scores precipitated by intraveneous administration of the challenge drug after 48 hour infusions of 100mg/kg/24h of morphine.

Table 1

Challenge Drug	Dose mg/kg	Mean behavioural score
Saline	0.03	5.0
Buprenorphine	0.03	10.0
Naltrexone	0.005	28.3
Naltrexone	0.015	35.0
Buprenorphine + Naltrexone	0.03 0.005	22.5
Buprenorphine + Naltrexone	0.03 0.015	40.8

Buprenorphine (0.03mg/kg) produced only very mild signs of withdrawal, as indicated by low mean behaviour scores. Naltrexone at an ADo dose of 0.005mg/kg in the rat tail pressure test produced rapid and intense abstinence effects which were maintained when combined with buprenorphine in a 1:6 ratio proposed for parenteral use and a 1:2 ratio proposed for sublingual use.

It is preferable to formulate the compositions in unit dosage forms i.e. physically discrete units containing the appropriate amounts of buprenorphine and naltrexone together with pharmaceutically acceptable diluents and/or carriers. Such unit dosage forms for parenteral administration are suitably in the form of ampoules and for sublingual administration in the form of tablets.

Compositions intended for parenteral administration

comprise an isotonic solution of buprenorphine and naltrexone in sterile water. Conveniently the solution is made isotonic by use of dextrose and sterilised by autoclaving or by filtration through a membrane filter.

Compositions in the form of sublingual tablets contain soluble excipients such as lactose, mannitol, dextrose,

Claim

1. An analgesic composition in parenteral unit dosage form comprising an active dose of buprenorphine and an amount of naltrexone sufficient to prove aversive to a narcotic addict by parenteral administration but insufficient to compromise the analgesic action of the buprenorphine wherein the dose of buprenorphine is from 0.3mg to 0.6mg and the weights of naltrexone to buprenorphine are within the ratio of 1:12 to 1:3.

COMMONWEALTH OF AUSTRALIA

Form 10
Regulation
13(2)

PATENTS ACT, 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE

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Application Number: 50585/85.

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Priority:

Related Art:

This document contains the amendments made under Section 49 and is correct for printing.

TO BE COMPLETED BY APPLICANT

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Address for Service: ARTHUR S. CAVE & CO., Patent and Trade Mark Attorneys, 1 Alfred Street, Sydney, New South Wales, Australia, 2000.

Complete Specification for the invention entitled:

"ANALGESIC COMPOSITIONS"

The following statement is a full description of this invention, including the best method of performing it known to me:-

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ASC-49

This invention relates to analgesic compositions and more particularly to compositions containing buprenorphine.

Buprenorphine (International Non-proprietary Name for N-cyclopropylmethyl-7α-[1-(S)-hydroxy-1,2,2-trimethylpropyl]6,14-endoethano-6,7,8,14-tetrahydronororipavine) has been shown in clinical trials to be a potent antagonist analgesic lacking the psychotomimetic effects found with other antagonist analgesics. Buprenorphine effectively relieves moderate to severe pain in doses of 0.1mg or more administered either parenterally or sublingually. The optimum therapeutic range for single doses is 0.3mg - 0.6mg by injection and 0.1mg - 0.4mg for sublingual tablets.

In animal tests and in man buprenorphine has been shown to have both agonist (morphine-like) and (morphine) antagonist properties. However from direct dependence studies in animals and in man it has been concluded that buprenorphine does not produce significant physical dependence and the potential to produce psychological dependence is low as indicated by animal self administration studies and by the measurement of euphorigenic effects in human post addicts.

In man the agonist and narcotic antagonist characteristics of buprenorphine have been demonstrated in opiate addicts. In a study in Hong Kong oral buprenorphine in the dose range 6-16mg precipitated abstinence in opiate addicts presenting for detoxification. On the other hand in a study involving subjects stabilised on a relatively low daily dose of oral methadone, sublingual buprenorphine could

be substituted for methadone with only a low level of discomfort. In this situation buprenorphine was behaving as an opiate agonist of low intrinsic activity.

This limited ability of buprenorphine to subsitute for the opiates and its low-level opiate-like euphorigenic effects makes buprenorphine acceptable to some opiate misusers particularly when their favoured opiates are unavailable, and this has led to some illicit use of the drug. As will be discussed below the compositions of the present invention provide a means of enhancing the abstinence-precipitating properties of buprenorphine, and thus the aversive characteristics, without compromising its analgesic effect.

Preparations have been developed which protect the oral preparations of certain opioids from parenteral abuse by the incorporation of the narcotic analgesic naloxone (naloxone, chemically known as 1-N-allyl-14-hydroxy-nordihydro-morphinone). These preparations are based on the low oral bio-availability (~1%) of naloxone when compared to that of the opioids e.g. methadone (~50%) and pentazocine (~30%). Thus a significant quantity of naloxone can be introduced into oral preparations of these central analgesics without compromising their analgesic effect. If the opioid-naloxone preparations are dissolved in water and injected the naloxone is active and shows its narcotic antagonist activity. It thus blocks the euphorigenic activity of the opioid and eliminates the development of psychological dependence. The inhibition of opiate effects by naloxone also prevents the development of

physical dependence. U.S. Patent No. 3773955 to Pachter and Gordon describes the oral combination of naloxone with a number of opiates particularly methadone.

There are also examples in which naloxone has been incorporated into oral preparations of opioids to prevent primary oral abuse. The combination of tilidine and naloxone affords such an example. Tilidine acting through a metabolite is more potent when given by the oral route than the parenteral route. Consequently no advantage can be gained by the addict in self administration of tilidine by injection and as such the observed abuse of tilidine has been by oral administration. A product containing naloxone was introduced to protect tilidine against this abuse.

U.S. Patent No. 4457933 (issued 3rd July 1984) to Pachter and Gordon describes the protection with naloxone of oral dosage forms of various opioids against both oral and parenteral abuse. In this patent mention is made of the incorporation of 1-3mg of naloxone in an oral unit dose of buprenorphine (2mg).

To our knowledge there is no reference in the scientific or patent literature to the incorporation of naltrexone (naltrexone chemically known as 1-N-cyclopropylmethyl-14-hydroxynordihydromorphinone) into formulations of opioids to protect against misuse by opiate addicts.

We have now found that there is a limited range of ratios of buprenorphine with naltrexone for which, by injection, the analgesic performance is equal to that of buprenorphine alone whilst the abstinence-precipitating

effects in opiate-dependent subjects are equivalent to that of naltrexone alone. This is a surprising finding since, when the opiates such as morphine, methadone, and oxycodone are mixed with an opiate antagonist the agonist-antagonist interaction reduces the analgesic performance of the agonist and in complementary fashion reduces the opiate-inhibitory performance of the antagonist.

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In another aspect of the present invention, there is provided an analgesic composition in sublingual unit dosage form comprising an active dose of buprenorphine and an amount of naltrexone sufficient to prove aversive to a narcotic addict by parenteral administration but insufficient to compromise the analgesic action of the buprenorphine wherein the dose of buprenorphine is from 0.1mg to 0.4mg and the weights of naltrexone to buprenorphine are within the ration of 1:4 to 1:1.

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It is to be understood that the use of the terms buprenorphine and naltrexone comprehend not only the bases but also their pharmaceutically acceptable salts. Particular preferred salts are the hydrochlorides.

It will be appreciated that the required ratio of naltrexone to buprenorphine is dependent upon the proposed route of administration. Preferably the parenteral unit dosage form contains naltrexone and buprenorphine in a weight ratio of about 1:6 and the sublingual form in a ratio of about 1:2.

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Compositions intended for parenteral administration

comprise an isotonic solution of buprenorphine and naltrexone in sterile water. Conveniently the solution is made isotonic by use of dextrose and sterilised by autoclaving or by filtration through a membrane filter.

Compositions in the form of sublingual tablets contain soluble excipients such as lactose, mannitol, dextrose, sucrose or mixtures thereof. They will also contain granulating and disintegrating agents such as starch, binding agents such as povidone or hydroxypropyl-methyl cellulose and lubricating agents such as magnesium stearate.

The compositions in unitary dosage form for parenteral administration comprises from about 0.3 to about 0.6mg buprenorphine together with an amount of naltrexone such that the ratio by weight of naltrexone to buprenorphine is within the range of 1:12 to 1:3, and preferably 1:6 plus a pharmaceutically acceptable carrier.

The compositions in the form of a sublingual tablet comprise from about 0.1 to about 0.4mg buprenorphine together with an amount of naltrexone such that the ratio by weight of naltrexone to buprenorphine is within the range of 1:4 to 1:1, and preferably 1:2 plus at least one pharmaceutically acceptable carrier or diluent.

The invention is illustrated by the following Examples:-

Example 1

A parenteral formulation having the following composition

	mg/ml
Buprenorphine HCl	0.324

Naltrexone HCl		0.054
Anhydrous dextrose		50.0
Hydrochloric acid	to pH	4.0
Water for injection	to	1.0 ml

was prepared by dissolving dextrose, buprenorphine hydrochloride and naltrexone hydrochloride in that order with stirring, in about 95% batch volume of Water for Injection. The acidity of the solution was adjusted to pH 4.0 by the addition of 0.1M hydrochloric acid, and the solution was made up to volume with Water for Injection. The solution was filtered through a 0.22µm membrane filter and transferred to sterilised 1ml or 2ml glass ampoules containing 1ml or 2ml of the solution containing 0.3 or 0.6mg of buprenorphine base respectively. The ampoules were sealed and the product sterilised by autoclaving.

Example 2

The formulation of Example 1 was varied by using 0.028mg/ml of naltrexone hydrochloride instead of 0.054mg/ml.

Example 3

The formulation of Example 1 was varied by using 0.108mg/ml of naltrexone hydrochloride instead of 0.054mg/ml.

Example 4

A sublingual tablet formulation having the following composition

	mg/tablet
Buprenorphine HCl	0.216
Naltrexone HCl	0.108

Lactose	31.026
Mannitol	18.0
Maize starch	9.0
Povidone	1.2
Magnesium stearate	0.45
	60.0

was prepared by screening all the materials with the exception of the magnesium stearate through a 750µm seive and blending them together. The mixed powders were then subjected to an aqueous granulation procedure and dried at 50°C. The resulting granules were forced through a 750µm sieve and blended with magnesium stearate (pre-sieved through a 500µm sieve). The tablet granules were compressed to yield tablets of 5.56mm diameter and weight 60mg.

Example 5

The formulation of Example 4 was varied by using 0.054mg/tablet of naltrexone hydrochloride and 31.080mg/tablet lactose.

Example 6

The formulation of Example 4 was varied by using 0.216mg/tablet of naltrexone hydrochloride and 30.918mg/tablet lactose.

Example 7

The formulation of Example 4 was varied by using 0.108mg/tablet of buprenorphine hydrochloride, 0.054mg/tablet naltrexone hydrochloride and 31.188mg/tablet lactose.

In non-limiting summary, the invention provides:

(a) an analgesic composition in parenteral or sublingual dosage form comprising an active dose of buprenorphine and an amount of naltrexone sufficient to prove aversive to a narcotic addict by parenteral administration but insufficient to compromise the analgesic action of the buprenorphine; and

(b) a method of treating pain which comprises the administration to a patient of a parenterally or sublingually effective dose of buprenorphine together with an amount of naltrexone sufficient to prevent substitution in an opiate dependent subject.

The claims defining the invention are as follows:-

1. An analgesic composition in parenteral unit dosage form comprising an active dose of buprenorphine and an amount of naltrexone sufficient to prove aversive to a narcotic addict by parenteral administration but insufficient to compromise the analgesic action of the buprenorphine wherein the dose of buprenorphine is from 0.3mg to 0.6mg and the weights of naltrexone to buprenorphine are within the ratio of 1:12 to 1:3.

2. An analgesic composition according to Claim 1 wherein the weights of naltrexone and buprenorphine are in the ratio of 1:6.

3. An analgesic composition in sublingual unit dosage form comprising an active dose of buprenorphine and an amount of naltrexone sufficient to prove aversive to a narcotic addict by parenteral administration but insufficient to compromise the analgesic action of the buprenorphine wherein the dose of buprenorphine is from 0.1mg to 0.4mg and the weights of naltrexone to buprenorphine are within the ratio of 1:4 to 1:1.

4. An analgesic composition according to Claim 3 wherein the weights of naltrexone and buprenorphine are in the ratio of 1:2.

5. An analgesic composition as claimed in Claim 1 substantially as described in any one of Examples 1 to 3.

6. An analgesic composition as claimed in Claim 3 substantially as described in any one of Examples 4 to 7.

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7. An analgesic composition as claimed in claim 1 substantially as herein described.

8. A method of treating pain comprising administering an analgesic composition as claimed in claim 1 substantially as herein described.

DATED this 13th day of October, 1988.

RECKITT & COLMAN PRODUCTS LIMITED
By Its Patent Attorneys,
ARTHUR S. CAVE & CO.

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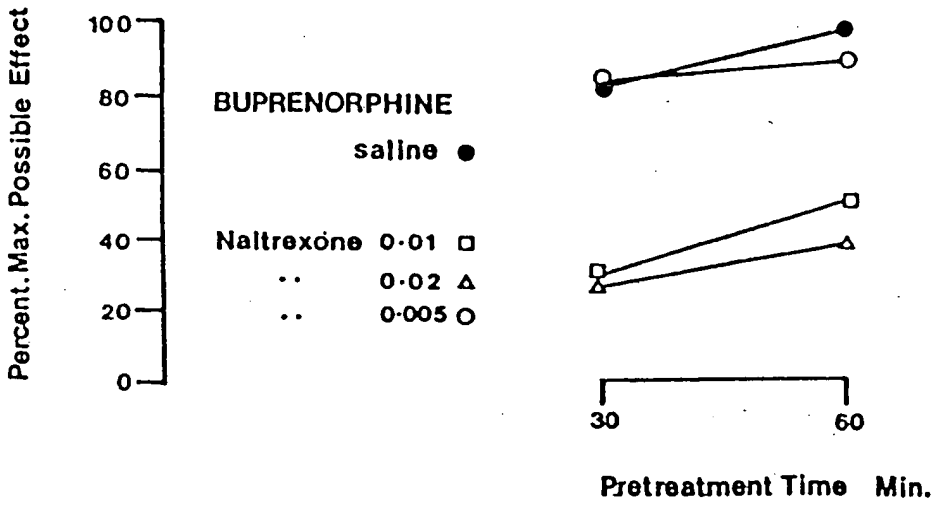
Percent. Max. Possible Effect
100
80
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BUPRENORPHINE
saline ●
Naltrexone 0·01 □
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